



MILLINGTON, TN

October 8, 2021

Arkema

Subject: October week 1 service report

Critical equipment and monthly equipment with issues are discussed in this report.

QualiTest® uses a four-step rating system for defects.

Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

Class II: Defect (s) present that may cause problem in long term (2-6 months.). Repair during normal maintenance scheduling. Continue to monitor.

Class III: Defect (s) present that may cause failure in short term (less than 2 months.). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

Class IV: Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs

Hi-Speed Industrial Service tests and inspects industrial machinery and equipment and makes recommendations concerning maintenance and repairs based on its experience in the field of industrial repair and maintenance. The information contained herein is provided as an opinion only, not as a guaranty or warranty of the matters discussed herein.

This completes our assessment of your equipment for this survey. Thank you for your business and don't hesitate to call if you have any comments or questions.

Sincerely,

David W. Shook
Senior Reliability Specialists
Hi-Speed Industrial Service
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H2O2 Weekly Route Critical Equipment Observations

C Concentrator Vacuum Pump 2130-1

The motor has the highest vibration amplitude of about 0.2"/second velocity peak overall in the outboard axial measurement. Vibration still consists of multiple low amplitude shaft speed harmonics with a dominant 4x RPM peak. **Rated a Class I Defect.**

Agitator, Hydrogenator C 7001-01

Data shows all vibrations are below 0.15"/second velocity peak overall. No immediate concern.

A/B Concentrator Vacuum Pump 57

The unit vibration overall is 0.38"/sec peak velocity for the outboard pump bearing and is dominated by a 16 order vibration which we believe to be vane pass. We will continue to watch for changes. **Rated a Class I Defect.**

Flash Vacuum Pump 2130-1

Data shows all vibrations are under 0.1"/second velocity peak overall. No issues of note.

Air Compressor C-201

Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. We see an increase in higher frequencies recently. We suspect this is impeller pass related. Overall acceleration is 10.6 g's RMS at 1 point. Synchronous 3x RPM and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class II Defect this survey.**

Air Compressor C-202

Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. We suspect this is impeller pass related. Overall acceleration is 5.7 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Air Compressor C-203

Rotor bar vibrations are normal for this motor's history. The trend clearly shows that the vibrations vary considerably over time. We still believe these motors have possible weak rotor bar end connections that cause the vibrations to fluctuate higher due to loading. There are still blower case vibrations around 2.5-3 KHz with a wide noise floor. We suspect this is impeller pass related. Overall acceleration is 5.2 g's RMS at 1 point. Synchronous and non-synchronous harmonic vibration peaks are evident in the data. All 3 compressors have the same non-synchronous peaks but vary in amplitude. We will continue to monitor this unit closely for changes. **Rated a Class I Defect.**

Instrument Air Compressor

The unit pad was still covered with an extremely slippery oily slimy mixture that prevented safe data collection.

Air Compressor NASH A 201-08A

Vibrations are still lower at 0.17"/sec velocity peak for the outboard vertical. The vibration spectrum is still dominated by a 20-order vibration, which is thought to be vane pass. **Rated a Class I Defect.**

D Hydrogenator Agitator 9002

Highest overall vibration is at 0.28"/sec velocity peak for the gearbox output top horizontal. 2 dominant vibrations are sub-synchronous to motor speed at about 9 Hz and a 10.5 orders. There appears to be a resonance, and the amplitude changes over time, but does not seem to be periodic. The others are most likely the number of pinion teeth (14 teeth and the input gear mesh) and the first harmonic of gear mesh. Ensure all fasteners are at proper torque values and inspect support structures for any signs of stress cracks, broken welds, or metal fatigue. **Rated a Class I Defect now.**

Middle Oxidizer Feed Pump 9001-2

Extreme jump in vibration at shaft speed in the unit indicated a coupling and possibly a resulting alignment issue. Immediate action was indicated and that was communicated to maintenance during the service. **Rated a Class IV Defect.** NOTE: the unit did in fact have a damaged coupling and alignment issues and was addressed promptly.

H2 Monthly Route Equipment

East Cooling Tower Pump

The pump still shows an elevated shaft speed vibration. Inspect the coupling, alignment, and all fasteners. **Rated a Class II Defect.**

FD Blower C2

The fan motor still has a high shaft speed vibration and has been steadily increasing since last August and is almost at 1/2" second velocity peak overall. Inspect the motor cooling fan, shaft coupling, alignment, structure, and all fasteners. **Rated a Class II Defect.**

PUMP MEA CIRC EAST P2B

The motor bearing acceleration is elevated and could indicate early distress in the bearings. Ensure the bearings are lubricated if applicable. **Rated a Class I Defect.**

Abbreviated Last Measurement Summary *****

Database: Arkema.rbm
Station: PEROXIDE
Route No. 3: ARK WK 1
Report Date: 13-Oct-21 09:38

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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2130-1old - C Concentrator Vacuum Pump		(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.076 In/Sec	.465 G-s	1200.0 RPM
21	.062 In/Sec	.480 G-s	
23	.199 In/Sec	.220 G-s	
71	.159 In/Sec	.760 G-s	
81	.165 In/Sec	.674 G-s	
83	.082 In/Sec	1.510 G-s	
7000-01 - AGITATOR, HYDROGENATOR C		(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
02	.041 In/Sec	.020 G-s	45.00 RPM
03	.044 In/Sec	.029 G-s	
11	.078 In/Sec	.567 G-s	1400.0 RPM
12	.073 In/Sec	1.000 G-s	
13	.146 In/Sec	.186 G-s	
21	.089 In/Sec	.508 G-s	
22	.128 In/Sec	.494 G-s	
23	.137 In/Sec	.932 G-s	
31	.080 In/Sec	.404 G-s	
32	.090 In/Sec	.525 G-s	
33	.050 In/Sec	.214 G-s	
41	.070 In/Sec	.405 G-s	
42	.079 In/Sec	.564 G-s	
51	.071 In/Sec	.288 G-s	375.0 RPM
53	.085 In/Sec	.277 G-s	
61	.034 In/Sec	.221 G-s	
71	.051 In/Sec	.323 G-s	45.00 RPM
81	.024 In/Sec	.184 G-s	
83	.051 In/Sec	.216 G-s	

57	- A/B Concentr Vac Pmp-var RPM (08-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.062 In/Sec	.283 G-s	900.0 RPM
12	.068 In/Sec	.331 G-s	
21	.075 In/Sec	.280 G-s	
23	.066 In/Sec	.171 G-s	
71	.125 In/Sec	.350 G-s	
81	.378 In/Sec	.880 G-s	
83	.110 In/Sec	1.056 G-s	
2130-1	- FLASH VAP VAC PUMP-var speed (08-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.037 In/Sec	.122 G-s	1200.0 RPM
12	.036 In/Sec	.195 G-s	
21	.043 In/Sec	.334 G-s	
22	.042 In/Sec	.203 G-s	
23	.053 In/Sec	.267 G-s	
71	.063 In/Sec	.342 G-s	
72	.062 In/Sec	.410 G-s	
81	.076 In/Sec	.390 G-s	
82	.086 In/Sec	.475 G-s	
83	.045 In/Sec	.500 G-s	
236-06	- HYDRO FD PUMP N 236-06 -2FLR (08-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.086 In/Sec	.261 G-s	3600.0 RPM
21	.075 In/Sec	.160 G-s	
236-26	- HYDRO FD PUMP S 236-26-2FLR (23-Aug-19)		
	OVERALL LEVEL	1-20 KHz	
11	.103 In/Sec	.160 G-s	1800.0 RPM
21	.073 In/Sec	.160 G-s	
23	.103 In/Sec	.160 G-s	
* 71	.031 In/Sec	.160 G-s	
* 72	.031 In/Sec	.160 G-s	
7007-24	- ABC SEC. FILT FEED PMP-SOUTH (25-Aug-21)		
	OVERALL LEVEL	1-20 KHz	
11	.039 In/Sec	.468 G-s	1800.0 RPM
21	.041 In/Sec	1.483 G-s	
23	.038 In/Sec	.247 G-s	
71	.152 In/Sec	1.971 G-s	
72	.123 In/Sec	2.482 G-s	
2130-6	- ABC SEC FILT FEED PUMP-NORTH (08-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.053 In/Sec	.304 G-s	1800.0 RPM
21	.043 In/Sec	.612 G-s	
23	.063 In/Sec	.687 G-s	
71	.206 In/Sec	.672 G-s	
72	.112 In/Sec	.716 G-s	
9001-1	- EAST OXIDIZER FEED PUMP (08-Oct-21)		
	OVERALL LEVEL	1-20 KHz	
11	.060 In/Sec	.233 G-s	1800.0 RPM
21	.061 In/Sec	.393 G-s	
23	.049 In/Sec	.141 G-s	

71	.118 In/Sec	.618 G-s	
72	.158 In/Sec	.298 G-s	
9001-2	- MIDDLE OXIDIZER FEED PUMP	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.067 In/Sec	.231 G-s	1800.0 RPM
21	.203 In/Sec	.624 G-s	
23	.184 In/Sec	.504 G-s	
71	.716 In/Sec	.205 G-s	
72	.431 In/Sec	.222 G-s	
7016-11	- WEST OXIDIZER FEED PUMP	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.026 In/Sec	.508 G-s	1800.0 RPM
21	.019 In/Sec	.386 G-s	
23	.016 In/Sec	.266 G-s	
71	.093 In/Sec	.843 G-s	
72	.132 In/Sec	1.455 G-s	
234-01	- CHILL WATER PUMP 234-01	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.050 In/Sec	.848 G-s	1790.0 RPM
21	.045 In/Sec	1.074 G-s	
23	.091 In/Sec		
71	.086 In/Sec	.214 G-s	
72	.087 In/Sec	.263 G-s	
C-203	- C-203 Comp	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.086 In/Sec	2.904 G-s	3588.0 RPM
12	.035 In/Sec	.279 G-s	
21	.028 In/Sec	.852 G-s	
22	.043 In/Sec	1.307 G-s	
23	.060 In/Sec	2.384 G-s	
	OVERALL LEVEL	1-20 KHz	
71M	.039 In/Sec	1.608 G-s	
72M	.043 In/Sec	1.524 G-s	
73M	.062 In/Sec	3.583 G-s	
81M	.038 In/Sec	3.628 G-s	
82M	.055 In/Sec	5.271 G-s	
71F	.045 In/Sec	2.297 G-s	
72F	.058 In/Sec	1.614 G-s	
73F	.084 In/Sec	2.354 G-s	
81F	.063 In/Sec	2.953 G-s	
82F	.060 In/Sec	2.005 G-s	
9000-02	- D HYDROGENATOR FD PUMP- EAST	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.026 In/Sec	.251 G-s	1800.0 RPM
21	.049 In/Sec	.511 G-s	
23	.039 In/Sec	.242 G-s	
71	.095 In/Sec	1.064 G-s	
72	.083 In/Sec	.685 G-s	
9000-01	- D HYDROGENATOR FD PUMP- WEST	(13-Sep-21)	
	OVERALL LEVEL	1-20 KHz	
11	.061 In/Sec	.220 G-s	1800.0 RPM

21	.058 In/Sec	.182 G-s	
23	.034 In/Sec	.387 G-s	
71	.114 In/Sec	.500 G-s	
72	.127 In/Sec	.561 G-s	
236-04A - HYDROGNTOR PRECOOLER FD PUMP (08-Oct-21)			
	OVERALL LEVEL	1-20 KHz	
11	.038 In/Sec	.347 G-s	1800.0 RPM
21	.067 In/Sec	1.545 G-s	
23	.054 In/Sec	.276 G-s	
71	.125 In/Sec	.243 G-s	
72	.068 In/Sec	.244 G-s	
C-202 - C-202 Comp (08-Oct-21)			
	OVERALL LEVEL	1-20 KHz	
11	.081 In/Sec	1.767 G-s	3588.0 RPM
12	.106 In/Sec	.672 G-s	
21	.068 In/Sec	1.247 G-s	
22	.090 In/Sec	1.300 G-s	
23	.071 In/Sec	2.301 G-s	
	OVERALL LEVEL	1-20 KHz	
71M	.038 In/Sec	1.736 G-s	
72M	.042 In/Sec	.894 G-s	
73M	.066 In/Sec	5.760 G-s	
81M	.041 In/Sec	5.691 G-s	
82M	.061 In/Sec	2.964 G-s	
71F	.029 In/Sec	3.422 G-s	
72F	.063 In/Sec	1.542 G-s	
73F	.076 In/Sec	3.901 G-s	
81F	.036 In/Sec	1.081 G-s	
82F	.044 In/Sec	.815 G-s	
C-201 - C-201 Comp (08-Oct-21)			
	OVERALL LEVEL	1-20 KHz	
11	.113 In/Sec	2.629 G-s	3588.0 RPM
12	.133 In/Sec	3.446 G-s	
21	.089 In/Sec	.908 G-s	
22	.044 In/Sec	.422 G-s	
23	.080 In/Sec	2.182 G-s	
	OVERALL LEVEL	1-20 KHz	
71M	.045 In/Sec	2.164 G-s	
72M	.045 In/Sec	2.881 G-s	
73M	.072 In/Sec	1.971 G-s	
81M	.084 In/Sec	3.665 G-s	
82M	.054 In/Sec	2.856 G-s	
71F	.048 In/Sec	2.197 G-s	
72F	.042 In/Sec	.661 G-s	
73F	.043 In/Sec	1.528 G-s	
81F	.042 In/Sec	10.56 G-s	
82F	.056 In/Sec	2.958 G-s	
new AC - INSTRUMENT AIR COMPRESSOR (13-Sep-21)			
	OVERALL LEVEL	1-20 KHz	
* 11	.121 In/Sec	.825 G-s	1780.0 RPM
* 12	.097 In/Sec	.679 G-s	
* 13	.059 In/Sec	.434 G-s	
* 21	.142 In/Sec	1.558 G-s	

* 22	.074 In/Sec	.868 G-s	
* 23	.049 In/Sec	.414 G-s	
	OVERALL LEVEL	1-20 KHZ	
* 71F	.117 In/Sec	7.788 G-s	
* 72F	.128 In/Sec	4.174 G-s	
* 73F	.282 In/Sec	2.483 G-s	
* 81F	.315 In/Sec	11.28 G-s	
* 82F	.311 In/Sec	13.15 G-s	
* 83F	.143 In/Sec	3.039 G-s	
71M	.115 In/Sec	6.427 G-s	
72M	.125 In/Sec	4.128 G-s	
73M	.108 In/Sec	5.032 G-s	
81M	.142 In/Sec	3.660 G-s	
82M	.189 In/Sec	3.068 G-s	
83M	.182 In/Sec	3.277 G-s	
201-08A	- COMPRESSOR,NASH A 201-08A	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.051 In/Sec	.088 G-s	506.3 RPM
12	.052 In/Sec	.129 G-s	
13	.099 In/Sec	.087 G-s	
21	.041 In/Sec	.075 G-s	
22	.053 In/Sec	.117 G-s	
23	.084 In/Sec	.061 G-s	
71	.122 In/Sec	.871 G-s	
72	.151 In/Sec	.774 G-s	
73	.096 In/Sec	.191 G-s	
81	.115 In/Sec	.409 G-s	
82	.171 In/Sec	.242 G-s	
83	.104 In/Sec	.296 G-s	
9002-10	- D-HYDROGENATOR AGITATOR	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHZ	
11	.085 In/Sec	.034 G-s	1185.0 RPM
21	.082 In/Sec	.152 G-s	
23	.046 In/Sec	.031 G-s	
	OVERALL LEVEL	1-20 KHZ	
31	.186 In/Sec	.829 G-s	
31L	.277 In/Sec	.678 G-s	
	OVERALL LEVEL	1-20 KHZ	
51	.203 In/Sec	.183 G-s	
51L	.250 In/Sec	.210 G-s	100.0 RPM
52	.277 In/Sec	.214 G-s	
52L	.226 In/Sec	.213 G-s	
53	.051 In/Sec	.219 G-s	
53L	.030 In/Sec	.221 G-s	
61	.199 In/Sec	.105 G-s	
61L	.183 In/Sec	.104 G-s	
81	.038 In/Sec	.045 G-s	
82	.037 In/Sec	.030 G-s	
83	.032 In/Sec	.188 G-s	
234-19	- Trane Refrig Machine (NEW)	(04-Mar-19)	
	OVERALL LEVEL	1-20 KHZ	
13	.028 In/Sec	.188 G-s	3600.0 RPM
11	.023 In/Sec	.188 G-s	
71	.016 In/Sec	.188 G-s	

81	.024 In/Sec	.188 G-s	
EP15	- CENTAC Compressor	(06-Aug-21)	
	OVERALL LEVEL	1-20 KHz	
11	.056 In/Sec	.153 G-s	3600.0 RPM
12	.079 In/Sec	.784 G-s	
13	.122 In/Sec	.206 G-s	
21	.109 In/Sec	.091 G-s	
22	.057 In/Sec	.591 G-s	
23	.055 In/Sec	.559 G-s	
* 901	.224 Mils		28171. RPM
* 902	.171 Mils		40980. RPM
* 903	.168 Mils		42931. RPM
8001-1	- Electric Joy Compressor	(05-Oct-15)	
	OVERALL LEVEL		
11	.140 In/Sec		3600.0 RPM
13	.102 In/Sec		
21	.216 In/Sec		
981	.374 Mils		22856. RPM
971	.487 Mils		
991	.356 Mils		31836. RPM
932	1.561 Mils		3580.0 RPM

Clarification Of Vibration Units:

Acc	-->	G-s	PK
Vel	-->	In/Sec	PK
Dsp	-->	Mils	P-P

* - Indicates Data Has Date/Time Different From Machine Date/Time
Abbreviated Last Measurement Summary

Database: Arkema.rbm
Station: HYDROGEN
Route No. 1: H2 MONTHLY
Report Date: 13-Oct-21 09:39

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	MACHINE SPEED
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P2B	- PUMP MEA CIRC EAST P2B	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.069 In/Sec	4.105 G-s	3585.0 RPM
21	.067 In/Sec	3.839 G-s	
23	.107 In/Sec	2.171 G-s	
71	.178 In/Sec	1.559 G-s	
72	.174 In/Sec	1.201 G-s	
P2A	- PUMP MEA CIRC WEST P2A	(30-Jun-21)	
	OVERALL LEVEL	1-20 KHz	
11	.088 In/Sec	.093 G-s	3585.0 RPM
21	.057 In/Sec	.122 G-s	
23	.049 In/Sec	.076 G-s	
71	.211 In/Sec	.180 G-s	
72	.177 In/Sec	.469 G-s	

P1B	- PUMP BFW EAST P1B	(30-Aug-21)	
	OVERALL LEVEL	1-20 KHz	
11	.056 In/Sec	.252 G-s	3600.0 RPM
21	.047 In/Sec	.721 G-s	
23	.041 In/Sec	.103 G-s	
71	.135 In/Sec	.165 G-s	
72	.122 In/Sec	.246 G-s	
81	.072 In/Sec	.213 G-s	
82	.072 In/Sec	.390 G-s	
83	.031 In/Sec	.948 G-s	
P1A	- PUMP BFW WEST P1A	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.102 In/Sec	.364 G-s	3600.0 RPM
21	.130 In/Sec	1.228 G-s	
23	.252 In/Sec	.313 G-s	
71	.108 In/Sec	.868 G-s	
72	.099 In/Sec	.949 G-s	
81	.143 In/Sec	.540 G-s	
82	.155 In/Sec	.813 G-s	
83	.060 In/Sec	.957 G-s	
C2	- FD BLOWER C2	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.459 In/Sec	.286 G-s	3600.0 RPM
21	.397 In/Sec	1.690 G-s	
23	.212 In/Sec	.899 G-s	
71	.252 In/Sec	1.684 G-s	
81	.279 In/Sec	1.528 G-s	
C1	- ID -BLOWER C1	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.107 In/Sec	.298 G-s	1800.0 RPM
21	.118 In/Sec	.484 G-s	
23	.133 In/Sec	.755 G-s	
71	.114 In/Sec	.884 G-s	
72	.067 In/Sec	1.563 G-s	
81	.219 In/Sec	.528 G-s	
82	.204 In/Sec	.964 G-s	
CTF-N	- COOLING TOWER FAN - NORTH	(22-Jan-18)	
	OVERALL LEVEL	1-20 KHz	
11	.227 In/Sec	.964 G-s	1780.0 RPM
12	.098 In/Sec	.964 G-s	
13	.765 In/Sec	.964 G-s	
21	.236 In/Sec	.964 G-s	
22	.411 In/Sec	.964 G-s	
23	.649 In/Sec	.964 G-s	
CTF-S	- COOLING TOWER FAN - SOUTH	(22-Jan-18)	
	OVERALL LEVEL	1-20 KHz	
11	.260 In/Sec	.964 G-s	1780.0 RPM
12	.077 In/Sec	.964 G-s	
13	.224 In/Sec	.964 G-s	
21	.219 In/Sec	.964 G-s	
22	.185 In/Sec	.964 G-s	

23	.258 In/Sec	.964 G-s	
CTPE	- EAST COOLING TOWER PUMP	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.229 In/Sec	1.186 G-s	1750.0 RPM
21	.070 In/Sec	.387 G-s	
23	.237 In/Sec	.574 G-s	
71	.176 In/Sec	.694 G-s	
72	.483 In/Sec	.641 G-s	
CTPW	- WEST COOLING TOWER PUMP	(08-Oct-21)	
	OVERALL LEVEL	1-20 KHz	
11	.140 In/Sec	.639 G-s	1750.0 RPM
21	.116 In/Sec	.530 G-s	
23	.077 In/Sec	1.759 G-s	
71	.186 In/Sec	1.124 G-s	
72	.121 In/Sec	1.328 G-s	

Clarification Of Vibration Units:

Acc	-->	G-s	PK
Vel	-->	In/Sec	PK
Dsp	-->	Mils	P-P